

Remarks

In the outstanding Office Action, all of the pending Claims 24-39 were rejected as unpatentable over Vesely U.S. Patent 5,817,022. In response, Applicant has filed a request for continued examination in the present amendment. By this amendment the rejected Claims 24-39 have been cancelled without prejudice and new Claims 40-46 have been substituted. Applicant submits that new Claims 40-46 are patentable over Vesely.

New Claims 40-41

Claim 40 defines an ultrasonic imaging method comprising (a) acquiring image data as defined, (b) generating a first extended field of view image from image data associated with a first phase of the physiological cycle from multiple selected ones of the frames of (a) associated with the first phase of the physiological cycle and acquired from substantially co-planar, partially overlapping spatial regions, (c) generating a second extended field of view image associated with a second phase of the physiological cycle from image data from multiple selected ones of the frames of (a) associated with the second phase of the physiological cycle and acquired from substantially coplanar, partially overlapping spatial regions; and displaying at least the first and second extended field of view images in sequence to a user.

Applicant submits that this invention is neither disclosed nor suggested by Vesely. In particular, the passage in Vesely at column 2, lines 35-64 relates to the creation of images within a three-dimensional volume of the heart (column 2, line 61). The 3-D data set described in this passage is created from 100 adjacent imaging planes that are positioned beside one another and slightly spaced away from one another (column 2, lines 49-53).

This is quite different from the invention of Claim 40, in which the first and second images are extended field of view images generated from image data acquired from substantially co-planar, partially overlapping spatial regions. The preferred embodiment of the invention of Claim 40 is described in conjunction with Figures 5 and 6. Note in particular the frames 70, 72, 74, which are substantially co-planar and overlapping. By generating an extended field of view image from the frames 70, 72, 74, a

two-dimensional image having an extended field of view is created. This is quite different from the three-dimensional data set described at column 2 of Vesely.

New Claim 40 is related in some ways to claims such as 25, 28, 33 and 36. Applicant submits that the portions of Vesely cited in the rejections of these claims do not warrant the rejection of new Claim 40. In particular, Claims 25 and 33 were rejected on the basis of column 6, lines 44-47 of Vesely. This passage describes user interaction with the computer system 10 in selecting a particular view for display. The selected views are registered images provided by the image registration system 116. As described, for example at column 6, line 24, the image registration system 116 provides a display in proper three-dimensional location inside a body structure. Applicant submits that this passage most suggests a three-dimensional registration system, and not the extended field of view images called for (b) and (c) that are generated from image data acquired from substantially co-planar, partially overlapping spatial regions.

Claims 29 and 36 were rejected on the basis of column 2, lines 47-53 and column 3, lines 7-10 of Vesely. Column 2, lines 47-53 has been discussed above, and this passage relates to image frames positioned in imaging planes slightly away from and beside one another. The passage at column 3, lines 7-10 relates to the faces of a cube that can be pushed interactively by moving a computer mouse. Both of these passages relate to conventional three-dimensional imaging techniques, and neither relates to extended field of view images of the type defined by Claim 40.

The grounds for patentability discussed above apply with equal force to Claim 41, and for all these reasons, Applicant submits that Claims 40 and 41 are patentable over Vesely.

New Claims 42-46

The new Claims 42-46 include independent Claim 42. This claim is similar to canceled Claim 24, except that acts (a), (b) and (c) have been revised or added. New Claim 42 now includes the act of (b) extracting a time reference based on a Doppler characteristic of the image data of (a), and (c) identifying each frame with a respective phase of a physiological cycle based at least in part on the time reference of (a). This

claim is supported by the application as filed, as for example in the paragraph at page 7, lines 5-10.


Applicant submits that nothing in Vesely suggests the invention of Claims 42-46. In particular, nothing in Vesely suggests the use of a Doppler characteristic of the image data to extract the time reference (Claim 42), such system wherein the Doppler characteristic of (b) comprises at least one of maximum Doppler flow velocity and maximum Doppler energy (Claim 43), such a system where (b) comprises assessing mean Doppler energy for the plurality of frames (Claim 44), or such a system where (b) includes detecting one of the frames characterized by a maximum mean Doppler energy (Claim 45). New Claim 46 defines the first and second images as respective extended field of view images created from selected frames of (a) acquired from substantially co-planar, partially overlapping spatial regions. New Claim 46 is submitted to be patentable for the reasons discussed above in conjunction with Claim 40.

The invention of Claims 42-46 represents an advance over Vesely, in that for the first time a system of the claimed type has been described which uses a Doppler characteristic to extract the time reference. This eliminates the need for a separate EKG sensor, and thereby simplifies the ultrasonic imaging method or system.

Conclusion

Applicant submits that new Claims 40-46 are all in condition for allowance in view of the foregoing amendments and remarks. Reconsideration is respectfully requested.

Respectfully submitted,



William A. Webb
Registration No. 28,277
Attorney for Applicants

BRINKS HOFER GILSON & LIONE
P.O. BOX 10395
CHICAGO, ILLINOIS 60610
(312) 321-4200